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Technical Memorandum

To: Candice Maxwell, United Taconite LLC
From: Rachel Walker, Dan Engel, and Christie Kearney, Barr Engineering Company
Subject: Wild Rice Field Survey for United Taconite LLC
Date: November 9, 2011
Project: 23/27-1156
c: George Pruchnofski, Barr Engineering Company

Introduction

United Taconite LLC (United Taconite) received a letter from the MPCA dated May 27, 2010 requesting a literature review and wild rice (*Zizania palustris* L.) field survey of receiving waters (Study Area) downstream from United Taconite's Forbes Plant and Tailings Basin near Forbes, Minnesota, and near the Thunderbird Mine in Eveleth, Minnesota. United Taconite submitted the Wild Rice Literature Review technical memorandum to the MPCA dated January 7, 2011 (see Attachment A). United Taconite received a letter from the MPCA dated May 16, 2011 requesting water quality monitoring for sulfate near wild rice during the survey of the Study Area; this letter is included as Attachment B.

The wild rice field survey and water quality monitoring results are presented in this memorandum. The memorandum includes observations of the following water bodies as listed in the MPCA letters, and as shown on Figure 1:

- SD-001/SD-003/SD-005: Ditch to Stream 1; Long Lake Creek to St. Louis River
- SD-002: Ditch to Stream 2; Mud Lake to Horseshoe Lake to Long Lake to Long Lake Creek to St. Louis River
- SD-004: Ditch to Snowden Creek/Elbow Creek; Elbow Lake to St. Louis River
- SD-006/SD-007/SD-008/SD-009: Ditch to Manganika Creek; Manganika Lake to East Two River to St. Louis River
- Little Tony Lake
- Twin Lake
- Round Lake
- Murphy Lake
- Mallard Lake
- Clover Lake

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Methodology

The purpose of the qualitative survey and water quality sampling was to document the presence or absence of wild rice and its relative stand density, as well as to take surface water samples in or near wild rice stands. The method used was similar to one used by the 1854 Treaty Authority, “Wild Rice Monitoring and Abundance in the 1854 Ceded Territory (1998 – 2008)” and other vegetation plot data surveys designed to quantify *in situ* plant species (e.g., *A Handbook for Collecting Vegetation Plot Data in Minnesota: The Relevé Method* (Minnesota Department of Natural Resources, 2007)).

Where wild rice was encountered, field crews recorded the GPS location, took photographs, and documented the location and a brief description of the wild rice stand. Dominant vegetation was noted along water bodies surveyed; Large Table A (in back of this memo) provides a list of common names for the scientific names included in this memorandum. Surface water samples were collected at each wild rice stand in streams. In lakes at least one surface water sample was taken at wild rice stands (with additional samples taken as needed based on distance between stands). Water samples were sent to Pace Analytical Laboratory in Virginia, Minnesota and were analyzed for sulfate π SO_4^{2-} .

A wild rice density rating, on a scale of 1 to 5, was applied to each observation of wild rice. The density rating was used to qualitatively assess the density of wild rice over a given area, and relates to the approximate percent coverage of wild rice (as listed in Table 1 and shown by example in Attachment C). As discussed above, a similar method was used by the 1854 Treaty Authority.

Table 1: Wild Rice Density Scale

Wild Rice Density Rating	Description
1	<10% Wild Rice Coverage
2	10 – 25 % Wild Rive Coverage
3	25 – 50 % Wild Rice Coverage
4	50 – 75% Wild Rice Coverage
5	>75% Wild Rice Coverage

The 1854 Treaty Authority only surveyed known wild rice water bodies and did not include reconnaissance of small stream systems. Some stream reaches for the United Taconite water bodies were non-navigable by kayak or inaccessible by foot due to physical characteristics of the habitat. These characteristics that limited access also made these stream reaches unfavorable for the growth of wild rice,

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such as channel morphology, dense vegetation, unsuitable substrate, or low water levels. These stream reaches were surveyed by consulting aerial photographs and by observing available road crossings for suitable wild rice habitat as shown on Figure 1 and described below.

It should be noted that wild rice typically grows in areas that have open water with direct sunlight, and areas that contain thick vegetation or overhanging forest canopy often limit the growth of wild rice by restricting direct sunlight to the plants.

The fieldwork consisted of consultation of aerial photographs and physical inspection on foot or in a kayak. Surveys and field work were conducted between August 10 and August 22, 2011. The results of the fieldwork are described below.

Wild Rice Survey Findings

After surveying approximately 47 miles of stream and 11 lakes within the Study Area, wild rice was only found in Mud Lake and Round Lake (Figures 1, 2, and 3). Wild rice occurrences on Mud Lake and Round Lake were generally quite sparse, with wild rice stand density ratings limited to “1” on the scale of 1 to 5. Details from the field survey are described below. Photographs of the Study Area are included as Attachment D.

Water Bodies Where Wild Rice Was Observed

Mine Drainage Area – NPDES Permit MN0044946

Mud Lake – Surveyed 8/19/2011

Wild rice was observed downstream of the Thunderbird Mine in Mud Lake in four distinct locations, each location with a density rating of “1” (Figure 2). Sulfate concentrations ranged from 19.5 to 19.6 mg/L in the three stands sampled (Figure 2 and Table 2). Water temperature at the wild rice stands ranged from 74°F to 76°F, and water depths ranged from 45 to 65 inches. The shoreline was dominated by dense cattails (*Typha* sp.), with sparse wild rice occurring in deeper open water.

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Table 2: Mud Lake Sulfate Concentrations

Wild Rice Observation Point	Sample ID	Sample Date	Sulfate Concentration (mg/L)	Approximate Number of Wild Rice Plants*
ML1	UT-MUD-KRM-1	8/19/2011	19.6 mg/L	10
ML2	UT-MUD-KRM-2	8/19/2011	19.5 mg/L	25
ML3	UT-MUD-KRM-3	8/19/2011	19.6 mg/L	25
ML4	---	---	---	5

*Field estimation; individual plants were not counted during survey.

Plant and Tailings Basin Drainage Area – NPDES Permit MN0052116

Round Lake – Surveyed 8/19/2011

Wild rice was observed downstream of the plant and tailings basins in Round Lake in several areas, each location with a density rating of “1” (Figure 3). Sulfate was not detected in lake samples at concentrations above the method reporting limit (1 mg/L) in any of the samples collected on Round Lake (Figure 3 and Table 3). Water temperatures at these stands ranged from 70°F to 75°F. Water depths where wild rice was observed ranged from 12 to 24 inches.

Table 3: Round Lake Sulfate Concentrations

Wild Rice Observation Point	Sample ID	Sample Date	Sulfate Concentration (mg/L)*	Approximate Number of Wild Rice Plants**
RL1	UT-ROUND-RNP-2	8/19/2011	< 1 mg/L	5
RL2	UT-ROUND-RNP-3	8/19/2011	< 1 mg/L	10
RL3	UT-ROUND-RNP-4	8/19/2011	< 1 mg/L	20
RL4	---	---	---	
RL5	---	---	---	60
RL6	---	---	---	
RL7	UT-ROUND-RNP-1	8/19/2011	< 1 mg/L	

*Method reporting limits were 1 mg/L; at < 1 mg/L, sulfate was not detected.

**Field estimation; individual plants were not counted during survey.

Water Bodies Where Wild Rice Was Not Observed

Mine Drainage Area – NPDES Permit MN0044946

Ditch to Stream 1; Long Lake Creek to St. Louis River – Surveyed 8/11/2011 and 8/17/2011

No wild rice was observed. This waterway was surveyed on foot from SD-001, southward to the intersection with the railroad grade near County Road 776. Long Lake Creek was surveyed by consulting

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aerial photographs, and by observing the channel along roads and at road intersections between County Road 776 and its confluence with the St. Louis River. Long Lake Creek's channel was overgrown with emergent vegetation, was very shallow, and was therefore not navigable by kayak or easily traveled on foot.

Very little open water was observed from SD-001 downstream to County Road 776. Numerous species were observed in the waterway, including *Alnus incana*, *Phalaris arundinacea*, *Salix* sp., and *Typha* spp.

At the intersection of Long Lake Creek and Peary Road, upstream of Thunderbird Trail, the channel was three to five feet wide, but was overgrown with *Carex* sp., *Phalaris arundinacea*, *Salix* sp., and *Impatiens capensis*. This portion of the channel had no open water and was not navigable by kayak. Water depth was six to 12 inches over a sandy substrate. No wild rice was observed. Similar observations were made for a stretch of Long Lake Creek downstream that was parallel to, and immediately west of, Peary Road that was surveyed on foot downstream to the intersection with Highway 37.

At the intersection of Long Lake Creek and County Road 382, the channel was about six to 10 feet wide. Water depth was six to 12 inches deep over a sandy substrate. Dominant vegetation included *Calamagrostis canadensis*, *Sparganium* sp., *Sagittaria* sp., *Carex* sp., *Salix* sp., and *Leersia oryzoides*. The open water areas along the stream were too narrow and too shallow to be navigated by kayak or on foot, and no areas of suitable wild rice habitat were identified on aerial photographs upstream or downstream of this intersection. No wild rice was observed at this intersection.

At the intersection of Long Lake Creek and County Road 310, the channel was estimated to be four to 15 feet wide, with estimated water depths of six to 12 inches. Adjacent land use was active pasture, with livestock and barbed and electric fencing alongside the road. Foot access was restricted by the fencing and active pasture along the stream, and the channel was too shallow to navigate by kayak. No areas of suitable wild rice habitat were identified on the aerial photographs upstream or downstream of this intersection. Dominant vegetation included *Calamagrostis canadensis* and *Carex* sp. No wild rice was observed at this intersection.

At the intersection of Long Lake Creek and Highway 16, the stream passed through a large concrete culvert. The bottom of the culvert was approximately 10 feet wide, with a water depth of zero to three inches. Approximately 100 feet downstream of the intersection, the channel narrowed to a width approximately six feet, and was not navigable by kayak or on foot due to thick vegetation and low water

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levels. Downstream of the culvert, dominant vegetation included *Scirpus* sp., and *Potamogeton* sp. No wild rice was observed along this area, and no suitable wild rice habitat was identified upstream or downstream of this area on aerial photographs.

Wild rice was not observed on Long Lake Creek; it is unlikely that wild rice would be found in this creek due to the presence of coarse substrate, thick overhanging vegetation, dense vegetation in the stream, and shallow water levels.

Ditch to Stream 2 to Mud Lake – Surveyed 8/11/2011

No wild rice was observed. This waterway was surveyed on foot from SD-002, southward to Mud Lake. The upper part of this waterway was a forested swamp that had become inundated from beaver activity. Numerous drowned trees stood in open water, and the shoreline was dominated by *Typha* sp., *Scirpus validus*, *Calamagrostis canadensis*, *Lemna* sp., *Spiraea alba*, and *Alnus incana*. The lower part of this waterway was a thickly vegetated shallow marsh. Dominant vegetation included *Typha* sp., *Calamagrostis canadensis*, *Glyceria* sp., *Scirpus atrovirens*, *Eleocharis* sp., *Spiraea alba*, *Salix* sp., and *Alnus incana*. The water was brown and turbid with algae.

Stream between Mud Lake and Horseshoe Lake

No wild rice observed. The stream was surveyed by kayak between Thunderbird Trail and Horseshoe Lake. At the time of the survey, the channel was five to 15 feet wide. The dominant vegetation included *Potentilla* sp., *Nymphaea odorata*, *Nuphar advena*, and *Typha* sp. The channel between Mud Lake and Thunderbird Trail was overgrown with *Calamagrostis canadensis*, *Typha* sp., *Alnus incana*, and *Phalaris arundinacea* with no open water and was not navigable by kayak or on foot. Consultation of aerial photographs and surveys of the channel at the Mud Lake outlet and at Thunderbird Trail did not result in identification of habitat conducive to wild rice growth in this area.

Horseshoe Lake – Surveyed 8/17/2011

No wild rice was observed. The entire perimeter of Horseshoe Lake was surveyed by kayak, and it was noted that approximately half of the shoreline was developed. The water was slightly turbid. The dominant vegetation included *Nymphaea odorata*, *Nuphar advena*, *Sparganium* sp., *Typha* sp., *Potentilla* sp., *Equisetum* sp., and other submergent macrophytes.

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Stream between Horseshoe Lake and Long Lake – Surveyed 8/17/2011

No wild rice was observed. The full stream length was surveyed by kayak. It passed through a forested wetland, and water levels were very shallow (0.5 to three feet deep). At the time of survey, the channel was five to 10 feet wide, with exposed fine sediments along the streambed. The dominant vegetation included *Calamagrostis canadensis*, *Fraxinus nigra*, *Impatiens capensis*, *Equisetum* sp., *Sparganium* sp., and *Sagittaria* sp.

Long Lake – Surveyed 8/17/2011

No wild rice was observed. The entire perimeter of Long Lake was surveyed by kayak. Long Lake had a high density of lakeshore development, with numerous docks, diving platforms, and moored boats visible along the shoreline. The water turbidity was low, with little to no algae. Dominant vegetation along the shoreline included *Nuphar advena*, *Nymphaea odorata*, *Typha* sp., *Scirpus* sp., and *Phalaris arundinacea*.

Ditch to Snowden Creek / Elbow Creek to St. Louis River – Surveyed 8/15/2011 and 8/16/2011

No wild rice was observed. The ditch and Snowden Creek were surveyed on foot from SD-004 to the west edge of Eveleth before the channel disappears underground in a storm sewer. The channel emerged again at County Road 101, and Elbow Creek was then surveyed by consulting aerial photographs and on foot at road intersections between County Road 101 and County Road 310 with the exception of a stretch downstream of Elbow Lake, as shown on Figure 1. The stretches of Elbow Creek between County Road 101 and County Road 310 were either too narrow or shallow to navigate by kayak, or were fenced off at access points due to active pastures. Elbow Creek was surveyed by kayak between County Road 310 and the confluence with the St. Louis River.

At the intersection of Elbow Creek and County Road 101, the channel re-appeared from a culvert after being underground from the west side of Eveleth. Downstream of the culvert, the creek was overgrown with vegetation and was less than five feet wide. The channel was fenced off with barbed wire and could not be accessed. In addition, the vegetation in the channel was too thick to navigate by kayak, and accessibility by foot was limited due to the adjacent land uses. Dominant vegetation included *Calamagrostis canadensis*, *Phalaris arundinacea*, *Polygonum* sp., *Impatiens capensis*, and *Echinocystis lobata*. No wild rice was observed in this area, and no suitable wild rice habitat was identified from aerial photographs.

At the intersection of Elbow Creek and County Road 755, the channel was approximately four to six feet wide and overgrown with vegetation. Vegetation in the channel was too thick to allow navigation by

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kayak or on foot. Dominant vegetation included *Calamagrostis canadensis*, *Impatiens capensis*, *Lemna* sp., and *Polygonum hydropiper*. No wild rice was observed in this location, and no suitable wild rice habitat was identified from aerial photographs.

At the intersection of Elbow Creek and Hwy 7, the channel was less than five feet wide with water depths of six to 12 inches. Vegetation in the channel was too thick to allow navigation by kayak or on foot. Dominant vegetation included *Calamagrostis canadensis*, *Urtica dioica*, *Rubus idaeus*, *Lemna* sp., *Equisetum* sp., *Carex* sp., *Salix* sp., *Impatiens capensis*, and *Echinocystis lobata*. No wild rice was observed in this area, and the vegetation still appeared to be too dense (no open water with direct sunlight) to contain wild rice at the intersection, and based on aerial photographs, upstream and downstream of this intersection.

The channel downstream of Elbow Lake was surveyed by kayak down to a large pond before the vegetation became too thick to navigate by kayak or on foot. This section of the channel was approximately 15 feet wide and three deep prior to becoming too dense to access further. No wild rice was observed in the stream that was kayaked or in the large pond, and based on consultation of aerial photographs, no suitable wild rice habitat was identified downstream.

At the intersection of Elbow Creek and Iron Junction Road, the channel was four to six feet wide, with an estimated maximum water depth of two feet. The channel was too narrow, too shallow, and vegetation was too dense to navigate by kayak or by foot. Dominant vegetation included *Calamagrostis canadensis*, *Lemna minor*, *Impatiens capensis*, and *Sparganium fluctuans*. No wild rice was observed at this intersection, and no suitable wild rice habitat was identified on aerial photographs upstream or downstream of this location.

The channel was observed from the intersection of Highway 37 and Elbow Creek. The channel was between two and six feet wide and approximately two feet deep. The channel was too narrow to navigate by kayak or foot. No suitable habitat for wild rice growth was identified on aerial photographs upstream or downstream of this intersection.

The channel was surveyed by kayak downstream of County Road 310 to the confluence of the St. Louis River. This portion of the channel ranged from 10 to 20 feet wide and one to two feet deep. No wild rice was observed along this section of Elbow Creek. Based on consultation of aerial photographs and physical observations of the channel at the intersection and upstream of County Road 310, Elbow Creek,

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in this location, did not have habitat conducive to wild rice growth. Vegetation in this area was primarily *Phalaris arundinacea*.

Wild rice was not observed in Elbow Creek. Based on survey by kayak, on foot, and from consultation of aerial photographs, the creek did not have habitat conducive to wild rice growth.

Elbow Lake – Surveyed 8/16/2011

No wild rice was observed. The entire perimeter of Elbow Lake was surveyed by kayak. Some lakeshore development was evident, but the shoreline was mostly undeveloped upland forest. Dominant vegetation included *Phalaris arundinacea*, *Nuphar advena*, *Typha* spp., *Polygonum hydropiper*, *Ceratophyllum* sp., *Nymphaea odorata*, *Calamagrostis canadensis*, *Sparganium fluctuans*, and *Lemna* sp.

Ditch to Manganika Lake – Surveyed 8/12/2011

No wild rice was observed. The short section of ditch upstream of Manganika Lake was surveyed for wild rice on foot along Shelton Road (County Road 372) and on aerial photographs, because the ditch was not navigable by kayak or fully accessible by foot. Based on observations along Shelton Road and on Manganika Lake, the ditch was overgrown with emergent vegetation with a forest canopy. The channel was approximately five feet wide and had no observable open water based on physical surveys and consultation of aerial photographs. The ditch outlet into Manganika Lake was obstructed by a dense monotypic stand of *Typha* sp, so the ditch could not be accessed from the lake. Based on the survey by foot and from consultation of aerial photographs, the ditch did not have habitat conducive to wild rice growth.

Manganika Lake – Surveyed 8/12/2011

No wild rice was observed. The entire perimeter of Manganika Lake was surveyed by kayak. The water was green and turbid. Several bays and sections of shoreline contained monotypic stands of *Typha* sp.

Manganika Creek to East Two River – Surveyed 8/12/2011

No wild rice was observed. Manganika Creek was surveyed by kayak from the outlet of Manganika Lake, downstream to the confluence with the East Two River. The stream ranged from four to 15 feet wide, and was usually less than three feet deep with mucky substrate. The water was green and turbid. The emergent macrophytes along the streambanks were primarily *Alnus incana*, *Salix* sp., *Phalaris arundinacea*, *Urtica dioica*, and *Cirsium* sp., and *Calamagrostis canadensis*.

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East Two River to St. Louis River – Surveyed 8/12/2011, 8/18/2011, and 8/22/2011

No wild rice was observed. East Two River was surveyed by kayak from its confluence with Manganika Creek, down to the confluence with the St. Louis River, with the exception of a 1-mile stretch between Iron Junction Road and Highway 37. This stretch was evaluated based on observations by kayak upstream and downstream and from consultation of aerial photographs. The surrounding land use was active cow pasture, and was bounded by barbed wire and electric fencing making access by kayak or foot potentially unsafe. Based on the observations by kayak and by consultation of aerial photographs, it is unlikely that wild rice exists in this channel reach. The stream was heavily impacted by the adjacent land uses and did not appear to contain suitable wild rice habitat (wide sections of open water).

For the sections of East Two River surveyed by kayak, the river substrate was variable, ranging from boulders and cobbles with riffles to muck under stagnant water. Water in the channel was very shallow and required the surveyors to frequently exit their kayaks to portage over riffles, rocks, and piles of driftwood. The stream width ranged from about five to 15 feet. Dominant vegetation included *Phalaris arundinacea*, *Polygonum hydropiper*, *Typha* sp., *Lemna* sp., *Calamagrostis canadensis*, *Impatiens capensis*, *Carex* sp., and *Scirpus* sp. No wild rice was observed in East Two River down to its confluence with the St. Louis River.

Plant and Tailings Basin Drainage Area – NPDES Permit MN0052116

Little Tony Lake – Surveyed 8/10/2011

No wild rice was observed. The inner perimeter of open water in Little Tony Lake was surveyed by kayak, and the outer perimeter was visible and surveyed by adjacent roads. Little Tony Lake was densely populated with *Typha latifolia* and submergent macrophytes; significant algal populations were also observed on the lake.

Twin Lake – Surveyed 8/10/2011

No wild rice was observed. The entire perimeter of Twin Lake was surveyed by kayak. The shoreline was undeveloped and densely populated with emergent macrophytes. Shallow waters of the lake contained *Typha* sp., *Potamogeton* sp., *Nuphar advena*, and other submergent macrophytes. Water depth near the shoreline was at least five feet, and turbidity of the water was low.

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Murphy Lake – Surveyed 8/16/2011

No wild rice was observed. The entire perimeter of Murphy Lake was surveyed by kayak. Murphy Lake had a high density of lakeshore development. The water had a low turbidity. The shoreline of the lake had a sandy substrate and was dominated by *Scirpus* sp., *Equisetum* sp., and *Sparganium fluctuans*.

Mallard Lake – Surveyed 8/10/2011

No wild rice was observed. The entire perimeter of Mallard Lake was surveyed by kayak. The shoreline was undeveloped and densely populated with emergent species from both forested upland and bog habitats. Vegetation in shallow parts of the lake was predominantly *Typha* sp., with very few submergent species. The lake water had low turbidity.

Clover Lake – Surveyed 8/10/2011

No wild rice was observed. The entire perimeter of Clover Lake was surveyed by kayak. Some shoreline development was evident, but the adjacent land cover was predominantly forested upland. The dominant species along the shoreline included *Typha* spp., *Calamagrostis canadensis*, *Sparganium angustifolium*, *Carex* sp., *Nuphar advena*, *Sagittaria latifolia*, *Potamogeton* sp., and *Ceratophyllum* sp. Some algae was observed.

Summary

The wild rice survey for United Taconite consisted of evaluating approximately 47 miles of stream and 11 lakes, as identified by the MPCA, to document the presence or absence of wild rice in the water bodies (Figure 1). The fieldwork was completed between August 10 and August 22, 2011. The lakes were surveyed by kayak, and the streams were surveyed either by foot, by kayak, or by examination of aerial photographs combined with surveys by foot along road crossings. Wild rice was not identified along the 47 miles of streams. Wild rice was found with a density rating of “1” (on scale of 1 to 5) in Mud Lake and Round Lake (Figures 1, 2 and 3). Wild rice was not identified along the other nine lakes.

Large Table A
Vegetation Summary
Wild Rice Survey Report
United Taconite, LLC

Scientific Name	Common Name
<i>Alnus incana</i>	Tag alder
<i>Calamagrostis canadensis</i>	Canada bluejoint
<i>Carex sp.</i>	Sedge
<i>Ceratophyllum sp.</i>	Coontail
<i>Cirsium sp.</i>	Thistle
<i>Echinocystis lobata</i>	Bur cucumber
<i>Eleocharis sp.</i>	Spike-rush
<i>Equisetum sp.</i>	Horsetail
<i>Fraxinus nigra</i>	Black ash
<i>Glyceria striata</i>	Fowl mannagrass
<i>Glycerica canadensis</i>	Rattlesnake mannagrass
<i>Impatiens capensis</i>	Jewelweed
<i>Leersia oryoides</i>	Rice cut-grass
<i>Lemna sp.</i>	Duckweed
<i>Nuphar advena</i>	Yellow water lily
<i>Nymphaea odorata</i>	White water lily
<i>Phalaris arundinacea</i>	Reed canary grass
<i>Polygonum hydropiper</i>	Water pepper smartweed
<i>Potamogeton sp.</i>	Pondweed
<i>Potentilla sp.</i>	Cinquefoil
<i>Rubus idaeus</i>	Red raspberry
<i>Sagittaria latifolia</i>	Arrowhead
<i>Salix sp.</i>	Willow
<i>Scirpus atrovirens</i>	Green bulrush
<i>Scirpus validus</i>	Softstem bulrush
<i>Sparganium angustifolium</i>	Narrowleaved bur-reed
<i>Sparganium fluctuans</i>	Floating-leaf bur-reed
<i>Spiraea alba</i>	Meadowsweet
<i>Typha angustifolia</i>	Cattail, narrow-leaved
<i>Typha latifolia</i>	Cattail, broad-leaved
<i>Urtica dioica</i>	Stinging nettle
<i>Zizania palustris</i>	Wild rice



Barr Footer: ArcGIS 10.0, 2011-11-02 11:28 File: I:\Client\United Taconite\Work Orders\Wild Rice\Map\Reports\2011 WildRice\Figure 1 Ground Wild Rice Survey Locations.mxd User: arm2 Imagery Source: FSA, 2010.

- MPCA Water Quality Monitoring Stations for United Taconite
- Surveyed Stream Segments
 - Stream Surveyed by Kayak
 - Stream Surveyed by Walking
 - Stream Surveyed at Road Crossings and on Aerial Photos
 - Other Rivers and Streams
- Surveyed Lake - Wild Rice Found
- Surveyed Lake - No Wild Rice Found

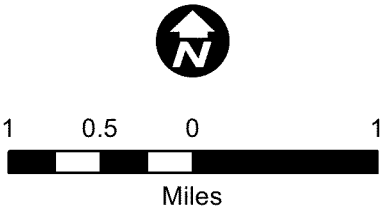
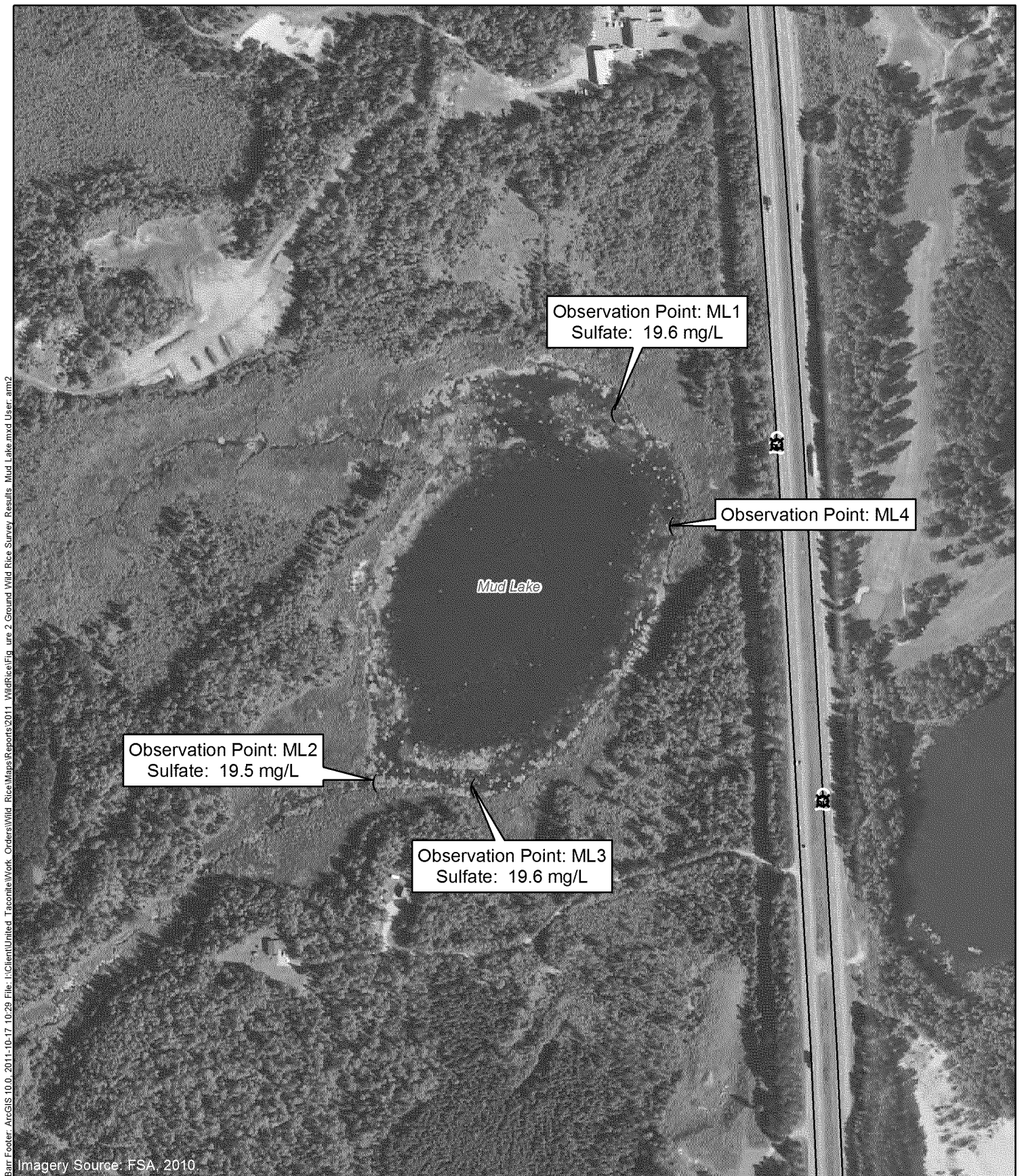


Figure 1
WILD RICE GROUND SURVEY LOCATIONS
AUGUST 2011
United Taconite LLC
St. Louis County, Minnesota



Wild Rice Density

- (1 <10% Wild Rice Coverage
- (2
- (3
- (4
- (5 >75% Wild Rice Coverage

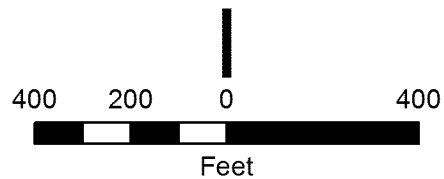
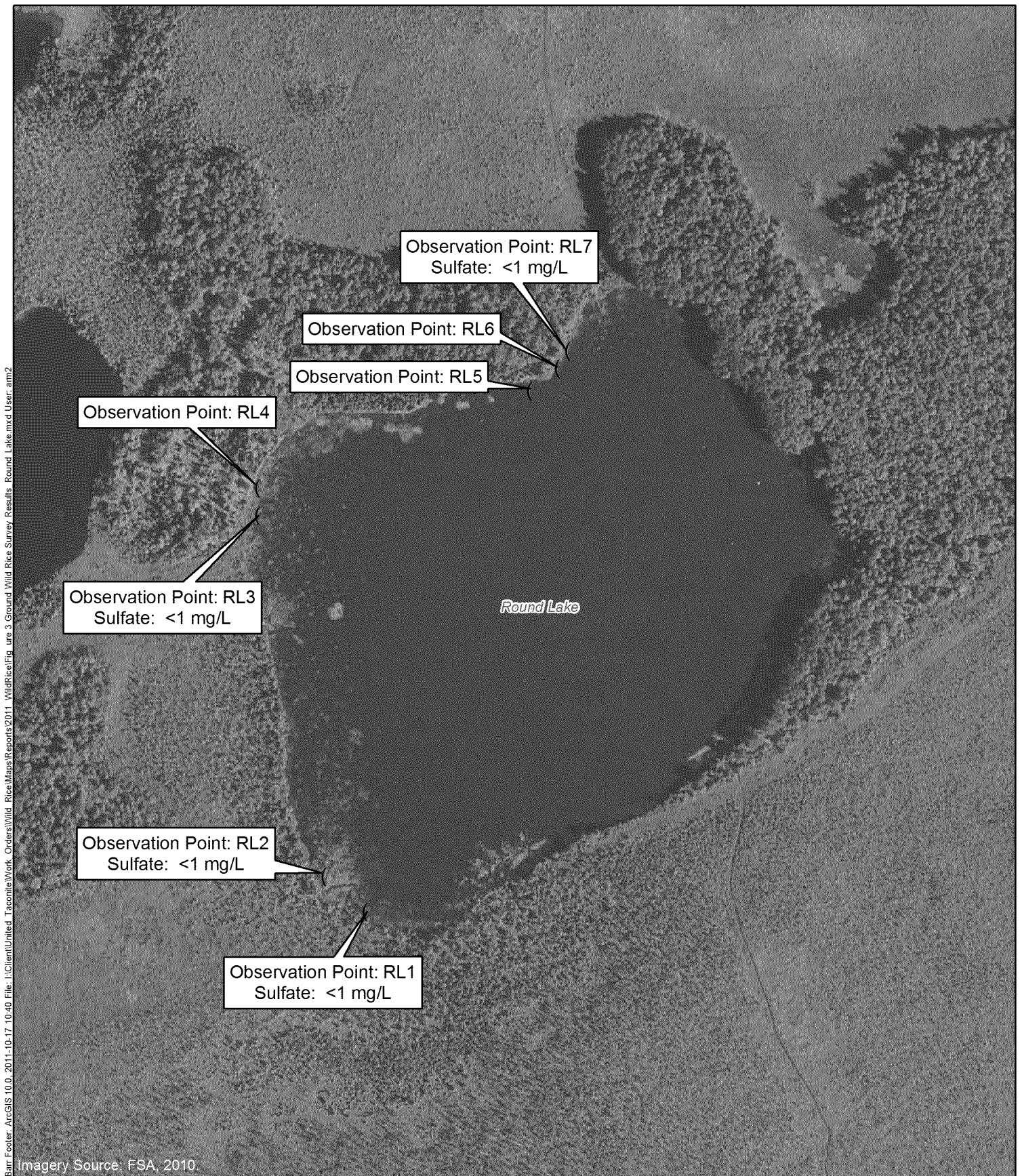


Figure 2
WILD RICE GROUND SURVEY
RESULTS - MUD LAKE
AUGUST 2011
United Taconite LLC
St. Louis County, Minnesota



Wild Rice Density

- { 1 <10% Wild Rice Coverage
- { 2
- { 3
- { 4
- { 5 >75% Wild Rice Coverage

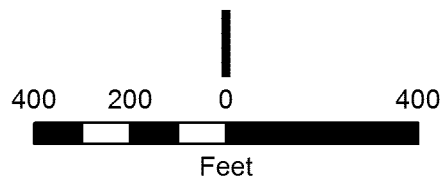


Figure 3
WILD RICE GROUND SURVEY
RESULTS - ROUND LAKE
AUGUST 2011
United Taconite LLC
St. Louis County, Minnesota

resourceful. naturally.
engineering and environmental consultants



Technical Memorandum

To: Candice Maxwell, United Taconite LLC
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Dan Engel, Barr Engineering
Subject: Wild Rice Literature Review for United Taconite
Date: January 7, 2011
Project: 23/27-1156
c: George Pruchnofski, Barr Engineering
John Borovsky, Barr Engineering
Christie Kearney, Barr Engineering

Per a Minnesota Pollution Control Agency (MPCA) request dated May 27, 2010, Barr Engineering Company (Barr) has performed a literature review of select surface waters (Study Area) near United Taconite's Forbes plant and tailings basin (United Taconite), near Zim, Minnesota.

The MPCA requested a literature review and field survey be carried out with respect to water bodies that they identified as receiving waters of United Taconite. This memorandum responds to the literature review portion of this request. These water bodies include (see Figure 1):

- SD-001/SD-003/SD-005: Ditch to Stream 1; Long Lake Creek to St. Louis River
- SD-002: Ditch to Stream 2; Mud Lake to Horseshoe Lake to Long Lake to Long Lake Creek to St. Louis River
- SD-004: Ditch to Snowden Creek/ Elbow Creek; Elbow Lake to St. Louis River
- SD-006/SD-007/SD-008/SD-009: Ditch to Manganika Creek; Manganika Lake to East Two River to St. Louis River
- Little Tony Lake
- Twin Lake
- Round Lake
- Murphy Lake
- Mallard Lake
- Clover Lake

To: Candice Maxwell, United Taconite LLC
From: Rachel Walker and Dan Engel
Subject: Wild Rice Literature Review for United Taconite
Date: January 7, 2011
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Barr researched documentation regarding the presence and absence of wild rice (*Zizania palustris* L.) in the above water bodies. Files and reports related to the Study Area are archived in three DNR Fisheries offices located in Duluth, Grand Rapids, and Tower, MN. Barr visited each of these offices and reviewed the following documents related to the Study Area:

- Department of Natural Resources lake and stream survey files, as described below.
- 2008 Department of Natural Resources “Natural Wild Rice in Minnesota” Report (2008 DNR Report). No Study Area waters were listed in this report;
- The 2010 Wild Rice Management Workgroup “350 Significant Wild Rice Waters in Minnesota” (List of Wild Rice Waters). The Wild Rice Management Workgroup is a coalition of federal, state, tribal resource managers and other wild rice stakeholders. The list is periodically updated and was last updated May 4, 2010. The list was originally drafted by Darren Vogt, Environmental Division Director, 1854 Treaty Authority with assistance from members of the Wild Rice Management Workgroup. The list was initially referred to as the 1854 Authority List and incorporates information from the DNR Wild Rice Harvester Survey. No Study Area waters were listed in this report;
- Various regional resource documents produced by the DNR, as described below;
- Vennum, Thomas. 1988. *Wild Rice and the Ojibway People*. No Study Area waters were discussed in this report;
- Discussions with tribal biologists from Leech Lake Band of Ojibwe, Bois Forte Band of Chippewa, and 1854 Treaty Authority, September 2009. No Study Area waters were specifically discussed.

Lake/Stream Survey Files

Each DNR office maintains files of surface waters within its management zone; the following is a summary of the documentation reviewed for each water body’s file.

Little Tony Lake (686-16)

The lake file was found at the DNR Fisheries Office in Grand Rapids, MN in digital format. The files contained some sketched maps of the lake. No vegetation data were recorded; the presence/absence of *Zizania sp.* was not documented.

Clover Lake (69-706)

The lake file was found at the DNR Fisheries Office in Grand Rapids, MN in digital format. The file only contained proposed fish stocking information from the 1950s. No vegetation data were recorded; the presence/absence of *Zizania sp.* was not documented.

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Mallard Lake (69-712)

The lake file was found at the DNR Fisheries Office in Grand Rapids, MN in digital format. The file contains some sketch maps from field work completed in 1967. No vegetation data were recorded; the presence/absence of *Zizania sp.* was not documented.

Round Lake (69-649)

The lake file was found at the DNR Fisheries Office in Grand Rapids, MN in digital format. The file contains some sketch maps and a brief fish stocking record from the 1930s. No vegetation data were recorded; the presence/absence of *Zizania sp.* was not documented.

Twin Lake (69-708)

The lake file was found at the DNR Fisheries Office in Grand Rapids, MN in digital format. The file contains a sketch, some dissolved oxygen data, and some fish stocking information from the 1960s. No vegetation data were recorded; the presence/absence of *Zizania sp.* was not documented.

Murphy (Horseshoe) Lake (69-646)

The lake file was found at the DNR Fisheries Office in Duluth, MN in paper format, and relevant information was copied. Lake Survey Reports for the years 1950, 1965, 1990, 1996, and 2004 all contained vegetative information for the lake. The survey work was completed August of each respective year, but none of the reports documented the presence of *Zizania sp.* The lake management plan noted that the next vegetative survey is scheduled for 2017.

Manganika Lake (69-0726)

The lake file was found at the DNR Fisheries Office in Tower, MN in paper format. The file contains lake survey summaries for the years 1984 and 1989. Vegetation data were also recorded in the 1984 report; no *Zizania sp.* were recorded. The 1989 report did not include vegetation data.

Mud Lake (69-0652)

The lake file was found at the DNR Fisheries Office in Tower, MN in paper format. The file contains no vegetative information.

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Horseshoe Lake (69-0654)

The lake file was found at the DNR Fisheries Office in Tower, MN in paper format. The file contained lake survey information from the years 1959, 1977, 1987, and 2002. Vegetative data were included in the reports for 1959, 1977, and 2002; none of the reports document the presence of *Zizania sp.* in the lake.

Long Lake (69-0653)

The lake file was found at the DNR Fisheries Office in Tower, MN in paper format. The file contained lake survey information from the years 1955, 1977, 1987, and 2002. The surveys completed in the years 1955, 1977, and 2002 contained vegetative information about the lake, but none of them documented the presence of *Zizania sp.*

Elbow Lake (69-717)

The lake file was found at the DNR Fisheries Office in Tower, MN in paper format. The file contained survey reports from the years 1968, 1982, and 1998. The 1982 report contained records on vegetation; no *Zizania sp.* were observed. The other two reports did not contain any information on vegetation.

Elbow Creek

The lake file was found at the DNR Fisheries Office in Grand Rapids, MN in paper format and contained only a public waters work permit for a stream crossing. No vegetation data were recorded; the presence/absence of *Zizania sp.* was not documented.

East Two River

No records were found at any of the DNR offices.

Long Lake Creek

No records were found at any of the DNR offices.

Regional Resource Documents

Wild rice investigational reports with regional or statewide significance were also reviewed. Many of the documents reviewed did not contain any information about wild rice for the Study Area. Information pertaining to wild rice from those reports is included below. The following documents were reviewed:

Investigational Report #22. Moyle. 1941. *Report on Minnesota Wild Rice for 1940*. Bureau of Fisheries Research, Division of Game and Fish

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Investigational Report #40. Moyle. 1942. *The 1941 Minnesota Wild Rice Crop*. Bureau of Fisheries Research Division of Game and Fish

Investigational Report #69: Moyle, J. and W. Kenyon. 1947. *A Biological Survey and Fishery Management Plan for the Streams of the Saint Louis River Basin*. Minnesota Department of Conservation Division of Game and Fish Bureau of Fisheries.

Investigational Report #71. Moyle. 1947. *Some Indices of Lake Productivity*. Bureau of Fisheries Research Minnesota Department of Conservation.

From these documents, the following information was found that is potentially relevant to United Taconite:

Report # 22

Report #22 did not contain any information for *Zizania sp.* for the Study Area.

Report # 40

Causes of failure of wild rice stands:

... The most important factors [a]ffecting the total yield are:

- 1. High water levels and fluctuation in water levels.*
- 2. Alteration of environmental conditions by a bumper crop.*
- 3. Poor pollination.*
- 4. Insect pests and diseases. pp. 16-20.*

Report #40 did not contain any information regarding *Zizania sp.* for the Study Area.

Report # 69

- Historic presence of wild rice in the St. Louis River Basin:

This report summarizes the vegetation for East Two River and Elbow Creek; wild rice was not recorded for these waters. p.72. No vegetation data were recorded for Long Lake Creek.

#38. *Zizania aquatica L.*, wild rice. – *Rare in most of the streams; most common in the western portion of the drainage basin. The most extensive stands are in the Floodwood and Swan River drainage basins.* p. 104. *Note: While the Swan River is not the same as the East Swan River, both could be considered to be in the western portion of the St. Louis River drainage basin. As per this report, wild rice is most common in the western portion of the St. Louis River.

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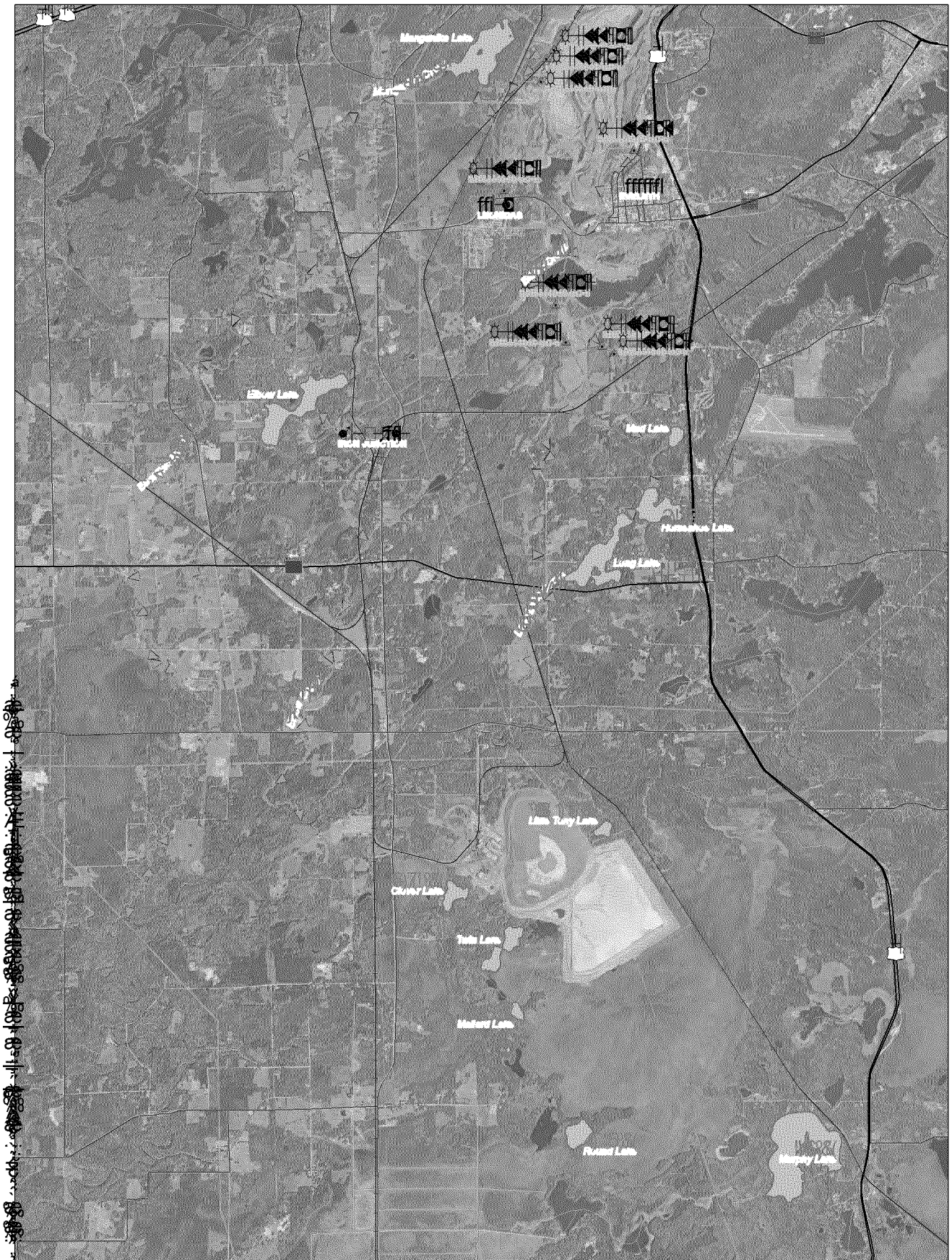
Report #71

Report #71 did not contain any information for *Zizania sp.* for the Study Area.

Conclusion

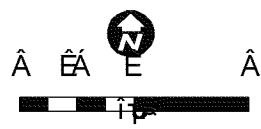
Based on the literature sources reviewed, none of the listed receiving waters have documented evidence of the presence of wild rice within the Study Area.

Figures



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Minnesota Pollution Control Agency

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May 16, 2011

Ms. Candice Maxwell
Environmental Engineer
United Taconite LLC
PO Box 180
Eveleth, Minnesota 55734

RE: NPDES/SDS Permit No. MN0044946
NPDES/SDS Permit No. MN0052116
Updated Request for Information on Wild Rice

Dear Ms. Maxwell:

The Minnesota Pollution Control Agency (MPCA) originally requested United Taconite to conduct a wild rice survey of receiving waters downstream of the Thunderbird Mine and Fairlane Plant/Tailings Basin in May 2010. It is our understanding, based on correspondence received in January 2011 that the company is planning to proceed with the wild rice survey during the growing season of 2011.

Our original request asked the company to conduct a field survey the following waters for the presence of wild rice until the waters reach the St. Louis River for the following receiving waters:

MN0044946 United Taconite – Thunderbird:

- SD-001/SD-003/SD-005: Ditch to Stream 1; Long Lake Creek to St. Louis River
- SD-002: Ditch to Stream 2; Mud Lake to Horseshoe Lake to Long Lake to Long Lake Creek to St. Louis River
- SD-004: Ditch to Snowden Creek/Elbow Creek; Elbow Lake to St. Louis River
- SD-006/SD-007/SD-008/SD-009: Ditch to Manganika Creek; Manganika Lake to East Two River to St. Louis River

MN0052116 United Taconite – Fairlane:

- Little Tony Lake
- Twin Lake
- Round Lake
- Murphy Lake
- Mallard Lake
- Clover Lake

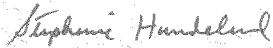
Ms. Candice Maxwell
Page 2
May 16, 2011

The MPCA would like to update its original request to ask the company to include the results of water quality monitoring for sulfate in the waters potentially impacted by the discharges in which wild rice is found to be present. The company should attempt to collect at least one grab sample for sulfate in each water where wild rice is found to be present. This data will be necessary to determine sulfate limits in the reissued permits.

Because the wild rice work is necessary for permit reissuance, work on the expired United Taconite Fairlane/Tailings Basin & United Taconite Thunderbird National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) permit reissuances will be on hold by the Agency. Once we receive the data from your survey work, we will continue to work on the permit reissuances for both of these permits. The information collected by the company will be important for the permitting process to ensure that appropriate water quality standards are applied and to ensure that surface waters, including those used for the production of wild rice, are adequately protected.

We appreciate your cooperation in this matter. If you have questions regarding this request, please contact me at 651-757-2405 or by e-mail at stephanie.handeland@state.mn.us.

Sincerely,



Stephanie Handeland
Land & Water Quality Permits Section
Industrial Division

cc: John Thomas, MPCA Duluth Regional Office

Density Level 1



Density Level 2



Density Level 3



Density Level 4



Density Level 5



Attachment C
Photographs Depicting Range of Wild
Rice Densities (1-5)

~6 Wild Rice Plants

**Photo 1: Mud Lake – Density 1 Wild Rice**

~12 Wild Rice Plants

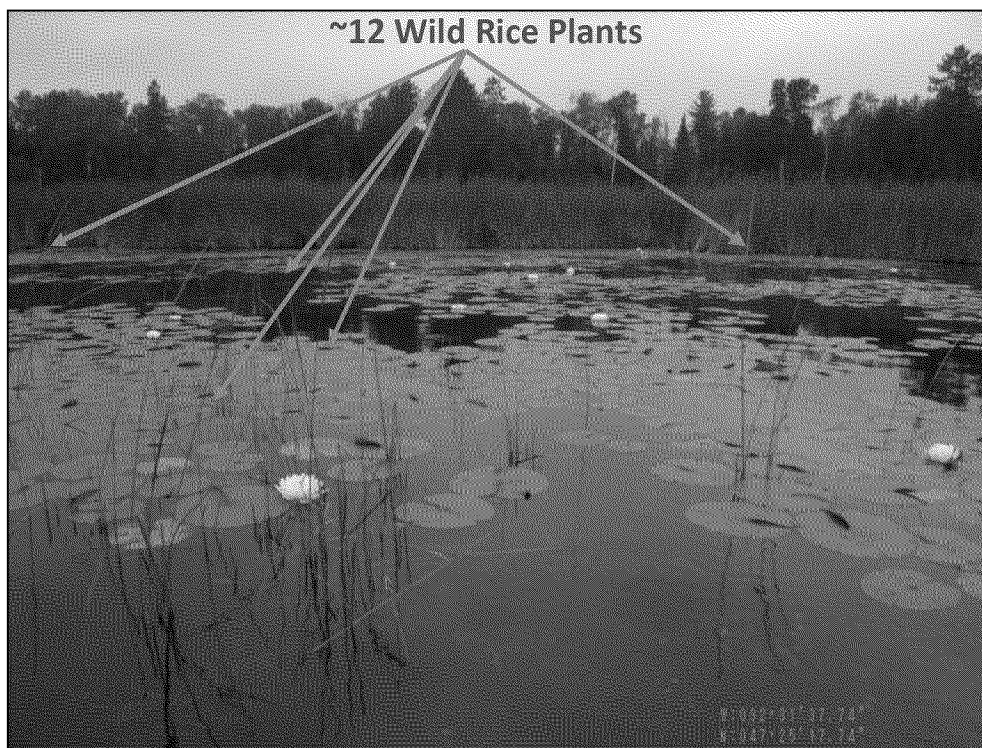
**Photo 2: Mud Lake – Density 1 Wild Rice**



Photo 3: Round Lake – Density 1 Wild Rice



Photo 4: Round Lake – Density 1 Wild Rice

2011 Wild Rice Survey for United Taconite LLC



Photo 5: Long Lake Creek (looking north) – no wild rice



Photo 6: Stream 2, Upstream of Mud Lake (looking northwest) – no wild rice

2011 Wild Rice Survey for United Taconite LLC



Photo 7: Horseshoe Lake (looking north) – no wild rice



Photo 8: Long Lake (looking north) – no wild rice



Photo 9: Elbow Creek (looking southwest) – no wild rice



Photo 10: Elbow Lake (looking west) – no wild rice



Photo 11: Manganika Lake (looking northeast) – no wild rice



Photo 12: Manganika Creek (looking east) – no wild rice



Photo 13: East Two River (facing south) – no wild rice



Photo 14: Little Tony Lake (looking southeast) – no wild rice

2011 Wild Rice Survey for United Taconite LLC



Photo 15: Twin Lake (looking south) – no wild rice



Photo 16: Murphy Lake (looking southwest) – no wild rice

2011 Wild Rice Survey for United Taconite LLC



Photo 17: Mallard Lake (looking east) – no wild rice

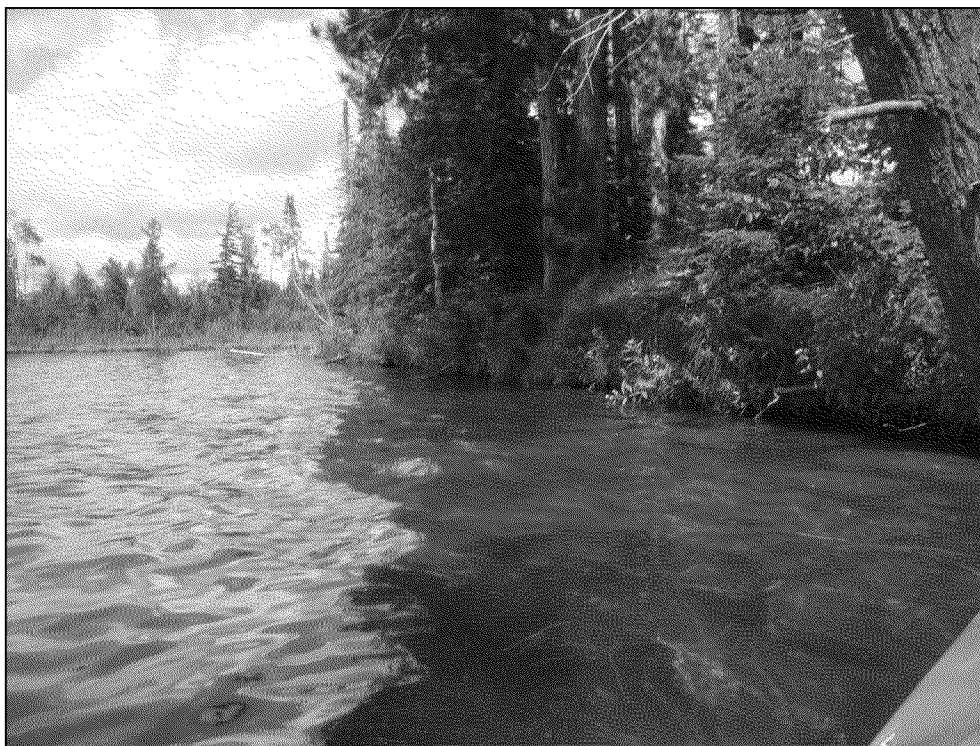


Photo 18: Clover Lake (looking northeast) – no wild rice